UCRL-JC-124273 Abs

OSCILLATORY GIANT MAGNETORESISTANCE IN Co/Cu MULTILAYERS WITH GRADED Cu SPACER LAYERS

Ming Mao, S.P. Vernon, P.J. Bedrossian, B. Law , F.R. Grabner and D. R. Kania, Lawrence Livermore National Laboratory, Livermore, CA 94551

The giant magnetoresistance (GMR) effect in magnetic multilayer (ML) systems should exhibit a marked dependence on the roughness of the interlayer regions between the ferromagnetic (FM) and non-magnetic (NM) layers. The roughness can modify the "local" interlayer coupling between the FM layers and alter the spin dependent electron scattering at the interfaces; both of these effects should influence the GMR properties of the ML. The role of the roughness in determining the GMR has been difficult to quantify experimentally because of instabilities inherent in ML fabrication. These result in layer thickness errors that alter the GMR and make intercomparison of "different" experiments difficult. We have minimized the effects of run to run process variation using a precision deposition technique to grow Co/Cu MLs with graded thickness Cu layers. The Cu layer thickness is radially symmetric and increases monotonically with substrate radius. It is selected to span the first, second and third peaks in the GMR response, respectively. The magnitude of the gradient is of order 0.1Å/mm. Reactive ion etching techniques are used to produce the desired substrate roughness. The surface is characterized using atomic force microscopy before and after ML deposition. Optical lithography and micofabrication are used to pattern the ML into constant Cu thickness regions to facilitate transport measurements. The room temperature GMR response for [Co(12Å)/Cu(XÅ)]30 where X= (8-12), (18-23), (28-34) for substrate roughness in the range from 1 - 10Å RMS is reported.

This work was performed under the auspices of the U. S. Department of Energy by Lawrence Livermore National Laboratory under contract number W-7405-Eng-48.

Category code:	II	Ming Mao
Cat. Subcode:	A	L-39
		Lawrence Livermore National
Session	Oral	Lab
Preference:		P.O. 808

Livermore, CA 94551

List of all authors on abstract:	Ming Mao	Tel. (510)-424-3425
	S.P. Vernon	FAX: (510)-423-1488
	P.J. Bedossian	E-Mail: mao2@llnl.gov
	B. Law	
	F.R. Grabner	
	D.R. Kania	

Ming Mao
Lawrence Livermore National Lab
Livermore, CA 94551
(510)-424-3425

S.P. Vernon
Lawrence Livermore National Lab
Livermore, CA 94551
(510)-423-7826

P.J. Bedrossian
Lawrence Livermore National Lab
Livermore, CA 94551
(510)-423-5938

B. Law
Lawrence Livermore National Lab
Livermore, CA 94551
(510)-423-3952

F.R. Grabner
Lawrence Livermore National Lab
Livermore, CA 94551
(510)-422-8088

D. R. Kania
Lawrence Livermore National Lab
Livermore CA 94551
(510)-422-8213